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NATIONAL INSTITUTE OF JUSTICE (NIJ) REQUIREMENTS DEFINITION AND TECHNICAL ASSISTANCE

Decision-Science Applications, Incorporated

Robert L. Decarlo

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AFRL-IF-RS-TR-1999-239 has been reviewed and is approved for publication.

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13. ABSTRACT *(Maximum 200 words)*

The mission of the National Law Enforcement and Corrections Technology Center - Northeast Region (NLECTC-NE), in conjunction with the Air Force Research Laboratory/Information Directorate (AFRL/IF), is to facilitate the identification, development, and adoption of new products and technologies specifically designed for law enforcement, corrections, and other criminal justice applications. The current technology thrust areas for the Northeast Region are Concealed Weapons Detection, Secure Communication, Timeline Analysis, Computer Forensics, Passive Location Tracking and Tagging, Audio/Video Processing, Information Management, Automatic Speaker Recognition, Automatic Language Translation and Facial Recognition. This report outlines the major accomplishments of the NLECTC-NE under the Decision-Science Applications (DSA), Inc. Task Ordering Contract (TOC), and identifies on-going technology efforts.

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1. BACKGROUND

The mission of the National Law Enforcement and Corrections Technology Center–Northeast Region (NLECTC-NE), in conjunction with the Air Force Research Laboratory/Information Directorate (AFRL/IF), is to facilitate the identification, development, and adoption of new products and technologies specifically designed for law enforcement, corrections, and other criminal justice applications. The current technology thrust areas for the Northeast Region are Concealed Weapons Detection, Secure Communications, Timeline Analysis, Computer Forensics, Audio/Video Processing, Information Management, Automatic Speaker Recognition, Automatic Language Translation and Facial Recognition. This report outlines the major accomplishments of the NLECTC-NE under the Decision-Science Applications, Inc. (DSA) Task Ordering Contract (TOC).

1.1 NLECTC-NE CENTER

The NLECTC-NE Center is located in Central New York at the Air Force Research Laboratory/Information Directorate (formerly Rome Laboratory) in Rome, NY. DSA and New York State Technology Enterprise Corporation (NYSTEC) support the management of the Center under contract. The Team consists of both DSA and NYSTEC personnel.

2. OUTREACH ACTIVITIES

The Team has conducted a number of outreach activities, primarily through presentations and attendance at regional and national law enforcement and corrections conferences and seminars across the Northeast. A list of the conferences and meetings is shown in Table 2.1.

Table 2.1 Outreach Activities/Conferences

DATE	CONFERENCE	LOCATION
April 1998	Middle Atlantic Great Lakes Organized Crime Law Enforcement Network (MAGLOCLEN) Conference	Pittsburgh, PA
April 1998	National Land Transportation Security Technology Conference	Atlanta, GA
April 1998 - February 1999	New York State Department of Correctional Services, Product Evaluation Committee	Albany, NY
May 1998	Law Enforcement Day	New Hartford, NY
May 1998	West Central Wardens and Superintendent Association Conference	Bloomington, MN
May 1998	Ohio Corrections Technology Network Meeting	Columbus, OH
May 1998	Southwest Border Technology	Albuquerque, NM

DATE	CONFERENCE	LOCATION
June 1998	Technology Forecast 98	Clinton, NY
June 1998	New Hampshire Chiefs of Police Training Seminar	Bretton Woods, NH
July 1998	Community Oriented Policing Services (COPS) Problem-Solving Partnerships Technical Assistance Workshop	Boston, MA
July 1998	International Association of Chiefs of Police State and Provincial Police Planning Officers Annual Meeting	Colonie, NY
July 1998	NLECTC-NE Cybercrime - Computer Forensics Seminar	Utica, NY
July 1998	Commission on Accreditation for Law Enforcement Agencies, Inc. (CALEA) Conference	Hershey, PA
August – September 1998	NLECTC-NE Exhibit at New York State Fair	Syracuse, NY
October 1998	Wisconsin LE Technology Conference	Eau Claire, WI
October 1998	138th Eastern Armed Robbery Conference	West Springfield, MA
November 1998	High Technology Crime Investigation Association (HTCIA) International Training Conference	Myrtle, SC
November 1998	The International Society for Optical Engineering (SPIE) East Conference	Boston, MA
December 1998	New York State Union Police Association	Newburgh, NY
January 1999	Computer Forensics Symposium	McLean, VA
January 1999	Investigation of Computer Crime Seminar	Corning, NY
January 1999	NLECTC Computer Crime Seminar	Washington, DC

3. TECHNOLOGY INITIATIVES

Support was provided, through interface with the Law Enforcement and Corrections community, to various AFRL/IF engineers in facilitating the introduction of technology into the hands of law enforcement and corrections agencies across the Northeast. These technologies include Concealed Weapons Detection, Speech Processing, Timeline Analysis and Facial Recognition. The four technology initiatives, outlined below, have been researched by AFRL/IF engineers and presented to the law enforcement and corrections community by the Team.

3.1 CONCEALED WEAPONS DETECTION

3.1.1 Background

The Air Force Research Laboratory (AFRL) manages and directs several programs funded by the Joint Program Steering Group (JPSG) which consists of the Defense Advanced Research Project Agency (DARPA) and the National Institute of Justice's Office of Science and Technology (NIJ/OS&T) in the Concealed Weapon Detection (CWD) area. The status of each of these tasks is described briefly below.

3.1.2 *Secure 1000* Imager

NIJ assisted in obtaining Food and Drug Administration (FDA) and Sandia reports on the ***Secure 1000***. The documents include FDA approval notices of the device and the Sandia National Laboratory report and evaluation of the ***Secure 1000*** (unclassified). Effort continued to gain permission from the Rhode Island State Radiation Control Office to install the ***Secure 1000*** in a Rhode Island correctional facility. The request was ultimately denied. The New York State Department of Health was contacted to determine the NYS position on use of the ***Secure 1000***. Coordination and support of vendor maintenance for the ***Secure 1000*** occurred during a site visit to Rome. Lastly, the ***Secure 1000*** was demonstrated to Congressmen and their staff in Washington, DC during an NIJ Technology Fair.

3.1.3 Millimeter Wave Imaging Radar

The Millimeter Wave Imaging Radar breadboard has been completed. Through data collection, initial results show that there is a distinct difference between a person carrying a concealed handgun and a person not carrying a gun. Additional data must be collected to fully understand the effects, aspect, angle, range, and innocuous objects. The current system is very susceptible to changes in aspect, angle and other types of motion and the current effort is focused on minimizing these motion effects. Techniques to increase the frame rate of the system have been developed and these techniques should alleviate some of the motion effects.

3.1.4 Body Cavity Imaging Breadboard

A body cavity scanning system based on a magnetic resonance imager has been developed and tested. The system is designed to detect contraband within pelvic body cavities. Initial test results indicate that the system is capable of detecting contraband in the presence of normal body organs, tissues and gases. The system can collect a three-dimensional image of the pelvic region in one minute and its primary use will be in a corrections environment. The government/contractor team has requested approval for human subject testing from an independent review board.

3.1.5 Millimeter Wave Imaging Radiometer

Lockheed Martin has assembled the 34-element millimeter wave focal plane array and completed the testing of 17 of the 34 elements. They have also completed the design and construction of the millimeter wave optical system. The 17 elements will be inserted into the millimeter wave optics to collect a "1/2 image". The results of this "1/2 image" will be used to evaluate the quality of the millimeter detectors. If this quality (ΔT and detector uniformity) is acceptable, the final 17 elements will be fabricated and installed into the optics.

Thermotrex Corporation has built a millimeter wave radiometer, however their system is based on a pupil plane array. The advantage of this system over the Lockheed Martin system is that it has the equivalent of hundreds of individual detectors. The disadvantage of this approach is that it has a fixed focus.

Lockheed Martin and Thermotrex are performing on going testing to maximize the minimum detectable temperature to insure sufficient sensitivity and to maximize the frame rate of the respective systems.

3.1.6 Through-the-Wall Surveillance

Through a Research Institute Grant, the Georgia Institute of Technology studied specific frequencies of operation to insure optimal wall penetration. Several Through-the-Wall Surveillance (TWS) radar systems were built for the purpose of demonstrating the strengths and weaknesses of the system. The Air Force received a dual band (14GHz and 55GHz) TWS system that will be used to evaluate RF penetration of various wall materials as a function of frequency. The Army, Marine Corp., DARPA, Navy, NIJ, and the Air Force Security Command were briefed on the results of the Through-the-Wall Surveillance technical study in Arlington, VA.

3.1.7 Other CWD Initiatives

Several frames of bomb data were collected using a breadboard millimeter wave radar system. Concurrently, the development of real-time algorithms for improved Concealed Weapons Detection (CWD) was started. An ultra-sound CWD system was tested on metallic and non-metallic weapons and innocuous items and a counterterrorism contract has been awarded.

The draft of the Pulsed Fast Neutron Analysis (PFNA) study is completed. The study was expanded to include the ability to relocate.

Three acoustic Concealed Weapons Detection systems were delivered to the Air Force for testing. These systems were evaluated and offered to law enforcement agencies for operational evaluation.

3.2 SPEECH PROCESSING

3.2.1 Background

AFRL/IF engineers have researched various Speech Processing technologies including audio/video restoration, spoken language translation, speaker identification, in-vehicle voice verification, and voice stress analysis. Progress and results on each of these initiatives is outlined below.

3.2.2 NIJ Funding Study for Applicability of Audio Technologies to Prison Applications

The focus of this effort was to perform a cost/benefit analysis on the use of existing technologies for federal prison applications. The areas of analysis included technologies that could improve prison control of inmates to reduce prison operating costs, control of inmate access and use of prison telephone systems, and the monitoring of conversations to obtain information on criminal activities in the prison environment.

Audio data was collected at the Raybrook Medium Security Prison in New York State and provided to Bureau of Prison (BOP) officials with an audiotape of speech data that had been processed through the Speech Enhancement Unit (SEU). Speech Enhancement reduced the audiotape's background noises and made the speakers discussion clearer. Visits have been made to the Raybrook Federal Correctional Institution in New York State and to the Allenwood Facilities. Data collected at each of those sites included pictures of telephone facilities, audio signal and communications collections, and detailed information on prisoner telephone access requirements, restrictions and procedures. Collected data was used to perform a cost/benefit analysis of the use of technology for federal prison applications, particularly on prisoner telephone access and control.

Characteristics of the recently procured Federal Prison telephone system have been reviewed. Technologies that were investigated for integration into a plan for improved telephone monitoring capabilities include: speaker identification, automatic recognition of keywords, phrases or jargon, recognition of background sounds, and noise reduction.

3.2.3 Voice Stress Analysis

The Voice Stress Analysis (VSA) investigation was to determine the value and usefulness of existing voice stress analysis technology for law enforcement and military requirements. If VSA technology is effective in detecting stress, it could be used in law enforcement applications to detect physical and mental stress during interrogations, to adapt speech recognizers to understand stressed speech, and to improve jam resistant voice communications.

Three types of experiments have been developed: a signal analysis investigation, a collection of data from a real VSA application and a laboratory experiment using human subjects. For the first experiment, a procedure for observing and identifying the signal processing activities of voice stress analysis systems was defined and applied in the laboratory. Dr. John Hansen of Duke University, a world-renown expert in stressed speech, reviewed current publications on the structure and functioning of VSA systems and analyzed real data collections. Extensive documentation of proper procedures for safe and effective experimentation involving human subjects has been reviewed, and will guide the preparation of the required Institutional Review Board (IRB) and research protocol.

Two commercial VSA systems have been acquired under this effort.

3.3 TIMELINE ANALYSIS

3.3.1 Background

The Timeline Analysis System (TAS) assists analysts with the comprehension of large amounts of information through the use of reasoning tools and data visualization for military and law enforcement applications. The most relevant law enforcement initiatives are discussed below.

3.3.2 Law Enforcement Interface

NLECTC-NE reviewed the status of TAS support to New York State Police Forensic Investigation Center cases, demonstrated progress to date and discussed the Timeline Analysis application for law enforcement with personnel from the New York State Police Violent Crimes Analysis Program.

3.4 FACIAL RECOGNITION PROJECT

3.4.1 Background

An NIJ Grant was issued to Anser Corporation for the "Advanced Face Recognition and Intelligent Software Agents" project. A Video Exploitation Lab was established to assist in the review and assessment of video processing applications for law enforcement.

3.4.2 Progress to Date

Support to NIJ for video and face recognition technology was established. Various Commercial-off-the-Shelf (COTS) and Government-off-the-Shelf (GOTS) applications were configured, installed and tested in a lab to evaluate their applicability to law enforcement needs in video processing and facial recognition. A demonstration version of Kodak's Dimensions software was acquired to review its utility in measuring object dimensions from still images and video frames.

A Beta version of the "Private Eye" software package from Cognitech Inc. was installed in the Video Exploitation Facility. A baseline of the video capture setup was established to feed data into Private Eye and begin running basic functionality on sample surveillance video. The application processing requirements and constraints on the Beta version were determined and reviewed from Anser on the Facial Recognition Cooperative Agreement to establish and analyze proposed costs for the Phase 2 effort.

4. COMPUTERCRIME INITIATIVES

Several projects were initiated dealing with state and local law enforcement Computercrime issues. Seminars and meetings are noted in the following sections.

4.1 SEMINARS

NLECTC-NE hosted a Cybercrime-Computer Forensics Seminar with presenters from the New York State Attorney General's Office, the New Jersey State Police High Tech Crimes Unit, the New York State Police Computer Crime Unit, the Utica College Economic Crime Investigation Program, MITRE Corporation, and the DOD Computer Forensics Laboratory. There were approximately 100 law enforcement officers and District Attorney's present. The entire seminar was videotaped and the proceedings were distributed to regional practitioners and the NLECTC-NE Advisory Council.

A second Computercrime Seminar was held at NIJ in Washington DC and hosted by NLECTC-NE. The purpose of this seminar was to provide a forum for the exchange of ideas in order to advance the NIJ response to the needs of state and local agencies in addressing Cybercrime and Computer Forensics. A representative from the NLECTC-NE briefed the Northeast Center's perspective on Computercrime and directed the discussion and wrap-up sessions.

An Investigation of Computercrime training seminar was attended by NLECTC-NE in Corning, NY. The SEARCH Group from Sacramento, California provided the training. A wide range of topics was covered, including system takedown, computer forensics, and legal issues. In the forensics area, topics addressed included recovery of deleted data, discovery of hidden data, restoration of partitions that have been altered to appear invalid, and slack space investigation.

4.2 ELECTRONIC CRIME GUIDELINES MEETING

An Electronic Crime Evidence Meeting was attended by an NLECTC-NE representative at the National Institute of Standards and Technology/Office of Law Enforcement Standards (NIST/OLES) as part of the Advisory Panel. The function of this meeting was to develop an outline for the First Responder Guidelines.

5. COMMUNICATIONS STUDIES

Several projects were initiated dealing with state and local law enforcement and corrections communications and interoperability issues as presented below.

5.1 UPPER MERION COMMUNICATIONS STUDY

The objective of this effort was to outline critical issues and identify potential options for the Upper Merion, PA Police Department relating to their current Land-Mobile Radio (LMR) system. The study addressed the issues of migration to new technologies the Upper Merion PD will need to consider when facing a procurement of a private LMR capability. It also addressed issues in the regulatory environment, technologies, and procurement strategy, to supply an overview of the issues that must be considered in making that decision. Specific activities included modeling of the current coverage in Upper Merion Township; analysis of issues relating to information management and mobile computing; visual site audits and recommendations. The goal was to aid decision-makers in their acquisition planning.

5.2 SYRACUSE COMMUNICATIONS STUDY

The goal of the Syracuse Communications Study was to review current wireless communications processes, review current coverage (analysis), and to define an optimization plan. The optimization plan considered existing equipment, regulatory issues, budgetary constraints, and future growth. Site audits were conducted of four antenna sites, and the information was recorded in a site database. The remaining two Syracuse transmitter sites were also audited and an analysis was performed to identify potential alternative transmission site locations.

The exact site locations, equipment parameters, propagation measurements, and police beat routes were collected and used to perform propagation modeling of the Syracuse Police Department communications system. Files for proposed new locations were built to be used in the propagation models, which have been completed. Lastly, the Interim Technical Report has been drafted and distributed.

5.3 VERMONT MICROWAVE RADIO STUDY

This study was conducted for the Vermont Department of Public Safety, Division of Criminal Justice Services. As part of the effort, we conducted an analysis of the current radio coverage in Vermont, along with a discussion of capacity and other requirements issues. We also

provided observations and recommendations on the approaches needed in procuring the necessary capabilities to implement a new system.

5.4 GENERAL COMMUNICATIONS EFFORTS

The McLean County IL Law Enforcement Communications and Information Systems study on communications interoperability and records management was completed. The final results of the study were briefed to the McLean County IL Sheriff's Department, the Bloomington, IL Police Department, the Normal, NY Police Department and other county officials.

The NLECTC-NE performed a comprehensive analysis of vendor proposals for the Ohio Department of Rehabilitation and Corrections (DRC) which was called the Bold Vision initiative. This analysis has been completed and the final written report submitted to the Ohio DRC.

6. NLECTC-NE ADVISORY COUNCIL

The NLECTC-NE Advisory Council is composed of law enforcement and corrections practitioners from each of the sixteen states in the Northeast region. Their mission is to provide prioritization of requirements, address state and local issues, and to support interfaces with the law enforcement and corrections community within each state.

The Council meets biannually within the various states in the Northeast region with the Team fully supporting each meeting, including the planning and coordinating of sites, agendas, travel arrangements and guest speakers.

7. TECHNICAL ASSISTANCE

Several projects were initiated dealing with technical assistance to state and local law enforcement and corrections facilities.

7.1 UTICA ARSON STRIKE FORCE

This effort was to evaluate the Utica Arson Strike Force's use of technology provided to them by the NLECTC-NE, which included a computer network and digital cameras.

Technical assistance was provided to the UASF with a digital camera for acquiring evidence at the scene of an arson fire. It was determined that a Local Area Network (LAN) would be necessary to take advantage of the ASCMe lead tracking and investigation software that was provided by the Bureau of Alcohol Tobacco & Firearms. A demonstration site including a LAN, a color scanner, laser printer and color printer was established. Technical support to install and administer the LAN was provided. Since its installation, the LAN has been used to administer a UASF web page, send and receive information on the Internet, and provide high quality investigation documents and wanted posters. In addition, it has provided the necessary technology to enable information sharing between the members of the UASF and the Utica Police Department Special Investigation Unit, which has led to the successful apprehension of major criminal figures. A report that was prepared for David Boyd of the NIJ has been made available for review in the NLECTC-NE document library.

7.2 UTICA 21 PROJECT

The purpose of this effort was to assist the Utica Police Department (UPD) in upgrading its information management system through utilization of NLECTC-NE staff personnel and

resources. The Utica 21 project was the result of a technology needs assessment for the Utica Police Department, which was conducted by the NLECTC-SE in cooperation with the NLECTC - NE. This project included a baseline assessment of the current information management practices, recommendations of improvements and a phased implementation plan to introduce technology into the department as time and resources allow.

The latest developments in the Utica 21 Project included creating a cost model for a new data server. The UPD has also purchased approximately six PCs and networked them over their existing system configuration. The UPD has attended demonstrations of RMS/CAD software packages from vendors for the purpose of evaluation. A Grant Coordinator and a part-time Information Management person have been hired.

7.3 ONEIDA COUNTY DRUG ENFORCEMENT TASK FORCE

The objective of this effort was to provide technical assistance and to evaluate the use of technology in assisting the Oneida County Drug Enforcement Task Force (OCDETF) in its mission of eliminating illegal drugs from Oneida County. NLECTC-NE personnel provided computer graphics support to the OCDETF for Operation Knee-High, which was a counter narcotics operation.

Initial application of the Image Database to the OCDETF Beta database requirement was completed. OCDETF was given assistance in the selection of surveillance equipment, i.e.; disguised body wire, a pin-hole camera with 8mm monitoring platform, repeater and audio monitoring platform, digital microcassette recorder and night vision goggles. NLECTC-NE assisted them in evaluating different surveillance equipment and a relational database for use in tracking leads and preparing court documentation, with functionality to perform research through the use of queries and reports. Lastly, a Capacity Building Analysis was performed and briefed to NIJ.

7.4 WIDE AREA NETWORK-CENTRAL NEW YORK

An information pipeline was established at locations across the county to enable real time sharing of law enforcement information with appropriate safeguards in a user-friendly environment. This was the product of a working group established by NLECTC-NE with representatives from the Oneida County Sheriff's Department, and the Utica and Rome Police Departments. Agencies participating in Wide Area Network-Central New York (WAN-CNY) included the Oneida and Onondaga County District Attorney's Offices, the Utica, Rome and New Hartford Police Departments and the Oneida County Sheriff's Department. The network is intended for use as a nationwide model for the law enforcement community.

NLECTC-NE personnel have analyzed the "Image Database" technology and the "DR-LINK" datamining tool, which may have applicability to the database efforts currently underway with WAN-CNY. A cost estimate and work plan were prepared for the project and submitted to Oneida County.

7.5 ADVANCED GENERATION INTEROPERABILITY FOR LAW ENFORCEMENT

NLECTC-NE, NIJ, JPSG, National Law Enforcement and Corrections Technology Center – Rocky Mountain (NLECTC-RM), International Association of Chiefs of Police (IACP) and the Alexandria Police Department have formulated program plans for AGILE. The overall AGILE program plan includes operational requirements, systems analysis, test evaluation and

integration with Alexandria Police Department. NLECTC-NE representatives are attending regular meetings at the NIJ in Washington, DC on AGILE's planning and standards development.

7.6 SCHOOL SECURITY PROPOSALS

Two school security proposals to NIJ have been drafted and presented. The first proposal is to work with the Idaho National Engineering Lab (INEL) and build a prototype CWD device called a Passive Magnetic Gradiaomiter for installation in the New York City School System. The second proposal is to investigate audio processing techniques and technologies to reduce the impact of terrorist activities, such as bomb and arson threats, made by telephone.

7.7 OTHER TECHNICAL ASSISTANCE EFFORTS

Technical support has been provided to the New York State (NYS) Department of Correctional Services (DoCS) Product Evaluation Committee (PEC). The PEC evaluates new products to be procured by the NYS DoCS system or facilities. Information coordination has been provided for the PEC by tracking product evaluations in other states to facilitate information exchange and provide technical advice on products under evaluation.

General technical support to the NLECTC-NE has been provided including compilation of reports for NIJ, conference and meeting coordination, maintenance of the Northeast website, facilitation of the 1033 surplus equipment program, and grant assistance. There have been 558 requests for information received by the NLECTC-NE since the Center began operations.

8. FUTURE OUTLOOK

The vast majority of NLECTC-NE's efforts are ongoing. Technical and administrative support will continue to be provided under follow-on contract funding.

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